

# Colloids

- (1 nm – 1  $\mu\text{m}$ )
- (All around us)
- Multibillion \$ Industry
- (1980 – Natural Opal)

## Colloidal Xtals

### Space

PhAse

PCS

- \* — Fundamental Questions  
(using **Monodisperse** Colloids like cannonballs)
- \* — Exactly when ( $\emptyset?$ ), how (xtallization time),  
and why (hardsphere - type) xtals are formed?  
ideal gas — fluid — xtal — glass
- \* — f.c.c. or h.c.p. structures (Model for atomic interactions)  
In nature 25% of the elements xtallize in the f.c.c. structure  
and 20% in the h.c.p.
- \* — Woodcock (1987)  $\Rightarrow$  f.c.c. phase is favored over h.c.p. by a  
tiny entropy difference  $(\text{f.c.c.})_{fE} - (\text{h.c.p.})_{fE} \sim 0.005 \text{ RT}$  much  
smaller than the numerical accuracy of previous calculations

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